

**MOBILE PHONE HAVING A DETACHABLE KEYPAD**  
**AND THE DETACHABLE KEYPAD THEREOF**

**PRIORITY**

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This application claims priority to an application entitled "Mobile Phone Having Detachable Keypad and the Detachable Keypad" filed in the Korean Industrial Property Office on February 28, 2001 and assigned Serial No. 2001-10566, the contents of which are hereby incorporated by reference.

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**BACKGROUND OF THE INVENTION**

**1. Field of the Invention**

The present invention relates generally to a keypad for a mobile phone, and in particular, to a mobile phone with a detachable keypad and the detachable keypad.

**2. Description of the Related Art**

A mobile phone user calls or answers a call or makes actions necessary for communicating by pressing keys. The user presses keys directly when using a bar-type mobile phone because its keypad is exposed, whereas the user must open a flip or a folder before using a keypad with a flip-type or folder-type mobile phone. In its internal structure, a keypad is connected to a key sensing port of a modem chip. Therefore, the keypad is bound to exist within a board. This integration of the keypad into the mobile phone sets some limitations in the effective use of the mobile phone.

Along with the recent technological developments and user demands, mobile phones have shrunk down in size and become more lightweight. As a result, the keypads have also been miniaturized. However, a keypad that is too

small may make it inconvenient for some users having large fingers to press keys. However, a large keypad may impair the convenience and appearance of the mobile phone. Moreover, a keypad is not an easy tool to access the Internet with because no mouse is available as with a computer keyboard.

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## SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a mobile phone having a detachable keypad.

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The above and other objects can be achieved by providing a detachable keypad and a mobile phone with the detachable keypad. The detachable keypad includes an earphone-microphone jack, a key array, and a DTMF (Dual Tone Multi-Frequency) generator. When a key is pressed with an earphone plug  
15 inserted into the earphone-microphone jack, a DTMF signal corresponding to the pressed key is transmitted to a microphone of a mobile phone through an earphone-microphone speaker. In the mobile phone, an earphone-microphone speaker fixing portion fixes an earphone-microphone speaker at a position suitable for a microphone to sense sound from the earphone-microphone speaker.  
20 An audio/DTMF separator separates a signal sensed at the microphone into an audio signal and a DTMF signal. A controller analyzes the DTMF signal and performs an operation according to the analysis result.

## BRIEF DESCRIPTION OF THE DRAWINGS

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The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a detachable keypad and a mobile phone according to  
30 an embodiment of the present invention;

FIG. 2 is a block diagram of the mobile phone illustrated in FIG. 1; and  
 FIG. 3 is a block diagram of the detachable keypad illustrated in FIG. 1.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

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A preferred embodiment of the present invention will be described hereinbelow with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

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FIG. 1 illustrates a detachable keypad and a mobile phone according to an embodiment of the present invention. In FIG. 1, reference numeral 100 denotes a mobile phone with a detachable keypad, reference numeral 200 denotes a magnet attached to a flip, reference numeral 300 denotes the detachable keypad, 15 and reference numeral 400 denotes an earphone-microphone jack positioned on a side surface of the detachable keypad 300.

Reference numerals 820, 840, 860, and 870 are earphone-microphone components, that is, a microphone, a speaker, a button, and an earphone- 20 microphone plug, respectively.

When a key is pressed in the keypad 300 with the earphone-microphone plug 870 inserted into the earphone-microphone jack 400, a DTMF (Dual Tone Multi-Frequency) signal is received at the microphone 250 of a mobile phone 25 100 through a speaker 840.

FIG. 2 is a block diagram of the mobile phone illustrated in FIG. 1. Referring to FIG. 2, an earphone-microphone speaker fixing portion 200-1 fixes the earphone-microphone speaker 840 at a position suitable for a microphone 250 30 to sense sound from the speaker 840. In the preferred embodiment, the earphone-

microphone speaker fixing portion 200-1 is the magnet 200 on the flip. The magnet 200 must be highly magnetic relative to known magnets, but not too magnetic to influence other components. While not shown, the earphone-microphone speaker fixing portion 200-1 can also be embodied as a mechanical  
5 holder.

An audio/DTMF separator 125 separates a signal sensed at the microphone 250 into an audio signal and a DTMF signal. A controller 120 analyzes the DTMF signal and performs a corresponding operation. That is, if the  
10 DTMF signal represents a digit or a character, the controller 120 controls a display 140 to display the digit or character. If the DTMF signal represents a command for an operation, the controller 120 performs the requested operation.

FIG. 3 is a block diagram of the detachable keypad illustrated in FIG. 1.  
15 Referring to FIG. 3, an earphone-microphone sensor 380 checks whether the earphone-microphone plug 870 is inserted into the earphone-microphone jack 400. A key press sensor 330 senses pressing of each key from a key array 320 and a DTMF generator 340 generates a DTMF signal according to the key press sensed by the key press sensor 330. If the pressing of a key is sensed with the  
20 earphone-microphone plug 870 inserted into the earphone-microphone jack 400, a controller 310 controls the DTMF generator 340 to generate a DTMF signal corresponding to the pressed key and transmits the DTMF signal to the earphone-microphone speaker 840 through earphone-microphone jack 400 and the earphone-microphone plug 870.

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A key volume control signal generator 350 generates a key volume control signal if the key press sensor 330 senses an input of a key volume control key. An amplifier 360 amplifies the DTMF signal received from the DTMF generator 340 by a predetermined level in response to the key volume control  
30 signal and transmits the amplified DTMF signal to the earphone-microphone jack

400. The key volume control signal enables the microphone 250 to receive the DTMF signal better.

In accordance with the present invention as described above, a keypad  
5 can be detached from a mobile phone. Therefore, the mobile phone can be  
designed to meet a user's specifications. For example, a keypad with small touch  
areas can be fabricated for women or others having small fingers. Alternatively, a  
keypad with relatively large touch areas can be fabricated for men or others  
having large fingers. The detachability of the keypad from the mobile phone also  
10 enables the mobile phone to be made in diverse colors or shapes. Moreover, since  
the keypad can be designed separately like an accessory, a variety of functions  
can be selectively added to the keypad, and function compatibility or merging is  
readily ensured. If a display (LCD) is disposed in the place of an existing  
keypad, the mobile phone can be further miniaturized.

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While the invention has been shown and described with reference to a  
certain preferred embodiment thereof, it will be understood by those skilled in  
the art that various changes in form and details may be made therein without  
departing from the spirit and scope of the invention as defined by the appended  
20 claims.